IMPLEMENTATION OF GUIDED INQUIRY WORKSHEET ON THE TOPIC OF ATOMIC STRUCTURE QUANTUM MECHANICS ON GRADE X

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ABSTRACT

Students are required personally to be more active through observing, questioning, collecting data, associating and communicating in the 2013 curriculum. One of the learning model that implements the curriculum 2013 is guided inquiry learning model. Guided inquiry learning model is a model student-centered learning, students work in small groups with individual role to ensure that all students are fully engaged in the learning process. To support the implementation of guided inquiry learning model implemented in small groups, the use of guided inquiry worksheet. Guided inquiry worksheet is made based on guided inquiry learning cycle consisting of five stages of orientation, exploration, concept formation, applications and closing. This research is experimental research, the design Randomized Control Group Posttest Only Design. The study sample consisted of two classes, experimental classes and control classes were obtained through simple random sampling technique. Based on the test results obtained by the average value of the experimental class (58.39) was higher than the control class (48.71). Results of tests of normality and homogeneity of the final test results obtained that both classes normally distributed and homogeneous samples. Data analysis was performed using t-test at the 0.05 significance level obtained $t_{count} = 5.12$ and $t_{table} = 1.67$. Based on the analysis shows that the learning outcomes of students who use guided inquiry worksheet is significantly higher than the learning outcomes of students who use general worksheet on the topic of atomic structure quantum mechanics on grade X.

KEYWORDS: guided inquiry worksheet, learning model, learning outcomes.

INTRODUCTION:

Students are required to be more personally active through observing, questioning, collecting data, associating and communicating in the 2013 curriculum. There are several important changes in the curriculum of 2013, 1) teacher-centered learning become student-centered learning, 2) one-way teaching (teacher-student interaction) into interactive learning, 3) passive learning into active-looking learning (inquiry learning)[4].

One of the learning models that implements the 2013 curriculum is the guided inquiry learning model. The guided inquiry learning model is a student-centered learning model, students work in small groups with individual roles to ensure that all students are fully engaged in the learning process[7]. To support the implementation of guided inquiry learning model that is implemented in small groups then used the guided inquiry worksheet.

Guided inquiry worksheet is made based on guided inquiry learning cycle consisting of five stages, orientation, exploration, concept formation, application and closing[2]. These five stages are in line with the demands of the 2013 curriculum, where the five stages contain observation, questioning, data collection, association and communicating activities demanded in the 2013 curriculum.

The topic of worksheet used in this research is atomic structure quantum mechanics based on guided inquiry. The worksheet has been feasibility test, that is validity test with validity value equal to 0,795 with high validity category and practice test with value 0,95 from teacher and 0,88 from student with very high practice category[8]. The atomic structure of quantum mechanics is one of the topic on grade X. The worksheet that used in this study has also never been tested.

MATERIALS AND METHODS:

This study is experimental research that conduct treatment (manipulation) to the research variable (independent variable). Then, observe the consequences of the treatment on the research object (dependent variable)[5]. The design of experimental research is Randomized Control-Group Posstest Only Desaign. The population of this study is all students on grade X. The sample in this study consists of two classes, experimental class and control class. Sampling was done by simple random sampling technique.

Experimental class is by using the guided inquiry worksheet developed by Rahmi Susmiati, who passed the test of validity and practicality. While in the control class used a general worksheet. Both classes are then performed the same test (posttest)[5].

The research was conducted in three stages, preparation stage, implementation stage and final stage. The preparation stages are to determine the place and the schedule of the study, the population and sample, the control class and experiment class, prepare the guided inquiry worksheet, analyze the 2013 curriculum, develop the lesson plan, make the test grille, try tests and keywords, compose a grid of final tests, final tests and answer keys. At the implementation stage, the worksheet is implemented in the research class. In the final stages of the study carried out the final test of the two classes, then proceed with data processing and the last is to draw conclusions.

The instrument of this study yields a valid, reliable and well-defined test of difficulty and differentiation. About the final test amounted to 21 questions with 5 choices of answers.

RESULTS:

Assessment of learning outcomes in this study is through the final test, which is an objective test of 21 items. Students who answered correctly were given a score of 1 with a value of 4.76 and students who answered incorrectly given a score of 0 with a value of 0. Student standard value in this study is 72.

Data was analyzed through different experimental class and control class value, normality test, homogeneity test and t-test. The value of the students learning outcomes in the experimental class and control class is calculated to obtain the mean values $(\bar{x})$, standard deviation (S), and variance (S2). From the two sample classes, the data obtained in Table 1.

Table 1: Average Score, Standard deviation, and Class Variance

Class	Σ Xi.Fi	N	$\bar{x}$	S	S^2
Experiment	1751,68	30	58,39	13,2	174,14
Control	1461,32	30	48,71	11,3	127,64

Based on Table 1 shows that the learning outcomes of the experimental class students (58.39) were higher than in the control class (48.71). To test whether the use of guided inquiry based sheets can improve student learning outcomes, hypothesis testing is performed. The hypothesis test is based on the normality and homogeneity test in both sample classes. The normality test analysis is summarized in Table 2.

Table 2: Normality Test Results on the Sample Class End Test

Class	N	A	Analysis	Distribution
Experiment	30	0,05	$L_t > L_0$	Normal
Control	30	0,05		

Based on Table 2 shows the value of L_0 in each sample class is smaller than its L_t value. This shows that the two sample classes are normally distributed. To determine the two sample classes have a homogeneous variance or no homogeneity test. The homogeneity test results are summarized in Table 3.

Table 3: Homogeneity Test Results on the Results of the Sample Grade End Test

Class	N	S	S^2	F_h	F_t
Experiment	30	13,2	165,44	1,36	1,85
Control	30	11,3	174,14		

Based on data analysis, the value of F_t for the experimental class and control class

with dk1 = 29 and dk2 = 29 is 1.85 at the real level of 0.05, whereas the F_h obtained is 1.36. The final result shows $F_h < F_t$ so it can be concluded that the experimental and control classes have a homogeneous variance.

Based on normality test and homogeneity test that both classes were normally distributed and had homogeneous variance. Therefore, to test the hypothesis used t test and hypothesis test results data. Based on data processing obtained $t_h =$ 5.12 and $t_t = 1.67$. In accordance with the criteria of hypothesis testing is H_0 rejected if $t_h > t_t$. Thus, it can be concluded that student learning outcomes that use guided inquiry worksheet are significantly higher than student learning outcomes using general worksheet on the topic of atomic structure of quantum mechanics.

DISCUSSION:

Based on the research conducted shows that there are differences in learning outcomes in the two sample classes. This can be seen from the average of student learning outcomes, where the students' learning outcomes in the experimental class is 58.39 and the control class is 48.71. Based on normality and homogeneity test results, it is found that both classes are normally distributed and homogeneous. Therefore for hypothesis testing done with t-test. From the t-test results obtained that the proposed research hypothesis is accepted, the results of student learning using inquiry worksheet guided significantly higher than the results of student learning using the general worksheet on the topic of atomic structure of quantum mechanics on class X.

The guided inquiry worksheet contains orientation or prerequisite knowledge, information and models of drawings and tables, key questions, exercises and questions. The model in the form of images is available in microscopic and macroscopic form and is accompanied by colors that can attract students' interest in learning. In that case, students observe and analyze models to answer questions. Questions that can encourage students to think critically and analytically. The question is called the key question. These questions are made interconnected with each other from low level cognitive to high cognitive so that students can develop answers by thinking about what they find in the model / information, what they already know and what they have learned by answering the previous question.

The high learning outcomes of the students in the experiment class significantly from the students learning outcomes in the control class were also shown based on the students ability in the answers to the C3 level (application / application) and C4 (analyze). Based on the calculation, it is found that the experimental class students can answer more about C3 and C4 level compared to control class students, that is experiment class 59,23% C3 and 55% C4 while control class 41,83% C3 and 38,3% C4.

Based on the test results of learning, there are only a few students who can reach the standard score, 72. Based on this study, from 30 students who took the final test, there are 4 students in the experimental class whose value reaches the standard value. While in the control class, no students whose value reaches the standard.

The number of students who did not achieve the standard score is probably due to the learning process in the two sample classes using only the worksheet, without using any other teaching materials. It is also one of the obstacles encountered in this study, because the teaching materials that will be used at the time of the research are not yet available, so that during the learning process in both sample classes, students only use worksheets.

CONCLUSIONS:

Based on the results of research and data analysis, it is concluded that guided inquiry worksheet can improve learning outcomes on the topic of atomic structure of quantum mechanics on grade X.

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